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Competencies in Digital Media Literacy among Undergraduate Students using Structural Equation Modelling (SEM)

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ABSTRACT

The growth of modern technologies in this digital era plays a great role in society especially for the young generation since they adapt better to this new technology. This became a concern when their privacy is misused and false information unhesitatingly spread which can cause worst cases to happen such as suicide, political chaos, media panic and others. This study is carried out to study the significant effects of roles of media education, critical thinking skills, communication skills and technical skills on competencies in digital media literacy among students. A cross-sectional study design was conducted in UiTM Kota Bharu and a random sample of 305 students was selected using the Proportionate Stratified Random Sampling technique. Self-administered questionnaires were distributed to the students. Structural Equation Modelling (SEM) was used to achieve the aim of this study. The findings of this study indicate that the variables of critical thinking skills and communication skills have a significant effect on students' competencies in digital media literacy since the p-value is less than 0.05. The findings of this study are suitable for the public, institutions or any organizations that are eager to find suitable and effective approaches to reducing the negative influence of using digital media.

Keywords: *Digital Media Literacy*, *Student's Competencies*, *Structural Equation Modelling*

1 INTRODUCTION

Digital literacy is widely described as being capable of viewing, reading, analyzing, and creating one's statements in the text, audio, video, and multimedia [1]. With the changes in media and technology along with the flow of time, new technologies and media have been used for teaching and learning methods to develop young people's ICT skills. According to Hague &Williamson [2], digital literacy refers to reading and writing in the digital text, for example, students can read the information from websites and navigate through the hyperlinks while for writing they are able to upload their comments or write on their social networking sites. Digital literacy will provide functional skills to help students gain knowledge to operate and communicate with technology and media. The presence of the internet has given the biggest impact on the growth of new media in cyberspace when any information spread through social media will receive a large audience. This media evolution brings a new manner of conveying messages and information, especially to the public and youngsters. Despite

many advantages arising together with the digital media revolution; the potential obstacles occur equally in social, environmental, and educational.

There are possible positive and negative effects of using digital media. Therefore, people especially students have to be digitally literate in a complex manner which is not only focusing on how to use the digital tools but they have to know how to absorb and interpret the information correctly [3]. Digital media brings fresh methods of conveying messages and information to the public. However, most of the available online information may not be accurate [4]. Sharing and spreading incorrect information through social media will confuse and also unwanted panic.

Many studies have looked at the effect of media literacy on students' education. Researchers have studied how media literacy to help students become a wiser consumer of media, as well as fosters critical thinking in the students. However, there has not been a lot of attention given to the relationship between media literacy competencies and students' skills and abilities in academics specifically among youth. The feasibility of this study is essential to overcome the digital learning challenges and improve the digital media literacy competencies of university students. For that reason, this study aims to identify and analyze some determinant factors competencies in digital media literacy among undergraduate students. Therefore, this study considers the roles of media education, critical thinking skills, communication skills and technical skills as factors that determine the competencies in digital media literacy among undergraduate students.

Technical skills are the abilities and practical knowledge of processes and technology. They are practical and often relate to information technology. According to Li and Ranieri [5], the students should be taught technical skills as a condition for the other three aspects to explore problems and contemporary technological contexts properly with a specific point so that the students can access various sorts of digital media and technology as well as to upgrade their ability to use the technologies. Serafin [6] cited a technical skill related to media digital literacy as it is the only possible way to develop the individual and the whole society. Livingstone [7] also stated that digital competencies do not depend on the user but depends on the tools or it is arguable to depend on the application.

One of the important factors that may influence competencies is critical thinking skills. News and the latest information may develop someone's critical thinking. Critical thinking skills can be defined as the ability to analyze facts and form a judgment. This skill will help the students to digest the information received from media platforms. Media literacy can create an understanding and communication in a variety of ways [8]. Winesburg & Mc Grew [9] also agreed that the students are confident with their evaluation skill which is critical thinking when it comes to choosing information based on digital media.

Digital media platforms are the perfect platform for introverted people to engage their communication abilities [10]. Willbold [11] agreed that students can use all platforms of digital media literacy to communicate with their friends and lecturers if they want to ask a question and submit their task or assignment. It is supported by Baharuddin et al. [12] as lecturers practicing these digital media platforms as teaching tools will attract students' interest during the lesson process.

Media literacy plays a role in either giving positive or negative impacts on children and young adults on the important concept [13]. As Livingstone [14] has stated, the educational specialist talks about an instructional method, "media literacy" for people actively using mass media to allow them

informed media users. The experts have already underlined the role of giving children the perception of using media. Media literacy is not only a position in the education system that is a course, but it is also a process of philosophy and lifelong learning [15].

2 MATERIAL AND METHODS

This research was done using a cross-sectional research design where the data was collected only once. This research involved all the students in UiTM Kota Bharu which is 1464 students as a target population. By using the Raosoft sample size calculator with a 5 percent margin of error and 95 percent confidence level, the minimum sample size required for this research is 305 students. The sample was selected by using proportionate stratified random sampling where the populations of students were divided into six strata based on their course programs. The sample was taken from each stratum using simple random sampling based on the proportionate allocation formula.

$$n_i = N_i/N \times n \quad (1)$$

Based on the allocation formula, n_i is the sample size required for each stratum, N_i is the sample size for each stratum, N is the total population and n is the total sample required for this study. This study considers four factors that contribute to competencies in digital media literacy among students. Those factors are the roles of media education, critical thinking skills, communication skills and technical skills. Self-administrated questionnaires that are adopted by Zhang et al. [16] were used in this study. The questionnaires were distributed using the *WhatsApp Messenger* application for fast responses and the data was analysed using the Statistical Package for Social Science Program (SPSS) and Analysis of Moment Structures (AMOS). The questions were constructed based on the Likert scale ranging from 1 (strongly disagree) to 10 (strongly agree).

2.1 Relibility Analysis

The reliability analysis using Cronbach's Alpha was tested as the initial step in this study. The Cronbach's Alpha was used to measure the internal consistency of a research instrument and can describe how each item relates to the total of all the items. The Cronbach's Alpha value is range from 0 to 1. According to Hair et al. [17], the value of the reliability analysis is greater than 0.7 is considered good and acceptable.

2.2 Structural Equation Modelling (SEM)

Structural equation modeling is a multivariate statistical analysis technique that is used to measure and analyze the structural relationships of observed and latent variables. Structural equation modeling is comparable but more influential than regression analysis because it is a combination of factor analysis and multiple regression analysis. Structural equation modeling examines linear causal relationships among variables while simultaneously accounting for measurement error.

2.2.1 Normality Assumption of Structural Equation Modeling

Normality of the observation is the important assumption before constructing the model and checking for its fit indexes. The normality assumption can be examined using the skewness value range between -2 to 2 is acceptable [18].

2.2.2 Model Fit Indexes

The goodness of fit is statistics test for absolute, parsimonious and incremental goodness of fit. There are several statistical indices used to test the goodness of fit [17]. There are three categories of fitness indices which are absolute fit, incremental fit and parsimonious fit. In this study, the absolute fit was assessed based on Root Mean Square Error of Approximation (RMSEA). According to [17], the RMSEA value is less than 0.06 is acceptable. Incremental fit measures Comparative Fit Index (CFI) with the acceptable cut-off point being greater than 0.9 while the Parsimony fit was determined using Parsimony Normed Fit Index (PNFI) and Chi-square (ChiSq/df). The model is accepted if PNFI is greater than 0.05 and Chisq/df is less than 5.0.

2.2.3 Structural and Measurement Model

SEM generally consists of two parts which are the structural model and the measurement model. A measurement model measures the latent variable or composite variable while a structural model is used to test the hypothesis based on path analysis. The measurement model form is similar to Confirmation Factor Analysis (CFA). CFA is used to verify the measurement quality of all constructs of the latent variables that can be used in structural equation models (SEM). The first step in CFA is to calculating the factor loadings of the indicators (observed variables) that can be latent constructed by using the standardized factor loading squared which can estimate the amount of the variance of the indicator. The acceptable value for factor loading is 0.6 [17].

2.2.4 Validity and Reliability

Validity in SEM is measured as convergent and discriminant validity. Convergent validity is where higher indicator loadings indicate the strength of the indicators. In a convergent validity, Composite Reliability (CR) and Average Variance Extracted (AVE) were measured. According to [17], the composite reliability value must be higher than 0.6 and AVE should be higher than 0.5. HTMT analysis was used to ensure that the construct is highly correlated. The HTMT analysis should be lower than 0.85 or 0.9. The Heterorait-monotrait ratio of correlation (HTMT) is another solution to solve the discriminant validity. The HTMT analysis is been used to measure the resemblance of each latent variable [19]. This analysis can be used if the discriminant validity cannot be established to confirm the causal relationship between the paths of each latent variable [20].

3 RESULT AND DISCUSSION

3.1 Descriptive Analysis

The summary of the demographic profile of respondents was shown in Table 1. The result indicates that out of 305 of the total respondents, 211 (69.18%) are female while another 94 (30.82%) of them are male. Most of the respondents were in age between 21 to 23 years old with 276 (90.5%) of the respondents. The majority of the students are Part 5 students with 100 (32.8%), followed by Part 3 students with 83 (27.2%).

Table 1: Summary of descriptive analysis

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	94	30.82
	Female	211	69.18
Age	Less than 21	19	6.2
	21-23	276	90.5
	24-26	7	2.3
	More than 26	3	1.0
Semester	2	6	2.0
	3	83	27.2
	4	62	20.3
	5	100	32.8
	6	54	17.7

3.2 Reliability Analysis

Cronbach's Alpha is computed for each set of items measuring the same factor to provide evidence of reliability. The result for Cronbach's Alpha value was shown in Table 2.

Table 2: Reliability statistics

Section	Construct	No. of Item	Cronbach's Alpha
A	Demographic Profile	4	-
B	Students' Competencies in Digital Media Literacy	7 (SCB1-SCB7)	0.844
C	Roles of Media Education	6 (SCC1-SCC6)	0.929
D	Critical Thinking Skills	6 (SCD1-SCD6)	0.899
E	Communication Skills	6 (SCE1-SCE6)	0.835
F	Technical Skills	5 (SCF1-SCF5)	0.885

Table 2 shows that the reliability analysis for roles of media education, critical thinking skills, communication skills and technical skills are higher than 0.7 as recommended by [17]. This result indicates that all the items in each variable provide a reliable measure.

3.3 Normality Assumption

The skewness value was computed for checking the normality assumption in Structural Equation Modelling (SEM). The result indicates that all the skewness values lie between -2 to 2. It can be concluded that the distribution of data does not depart from normality as stated by [18].

Table 3: Normality assumption result

Variable	Items	Skewness	Items	Skewness
Students' Competencies in Digital Media Literacy	SCB1	-1.719	SCB5	-0.412
	SCB2	-0.661	SCB6	-0.862
	SCB3	-0.643	SCB7	-0.377
	SCB4	-0.559		
Roles of Media Education	SCC1	-1.255	SCC4	-1.427
	SCC2	-1.276	SCC5	-1.406
	SCC3	-1.201	SCC6	-1.125
Critical Thinking Skills	SCD1	-0.723	SCD4	-0.792
	SCD2	-0.526	SCD5	-1.037
	SCD3	-0.719	SCD6	-0.932
Communication Skills	SCE1	-1.521	SCE4	-0.743
	SCE2	-1.158	SCE5	-0.957
	SCE3	-0.709	SCE6	-1.222
Technical Skill	SCF1	-1.435	SCF4	-0.771
	SCF2	-1.598	SCF5	-0.840
	SCF3	-1.029		

3.4 Measurement Model

Confirmatory Factor Analysis (CFA) is the measurement part of SEM which shows the relationship between latent variable and indicator variable. The theoretical framework links four latent exogenous constructs which are roles of media education, critical thinking skills, communication skills and technical skills with one endogenous construct which is the student's competency in digital media literacy.

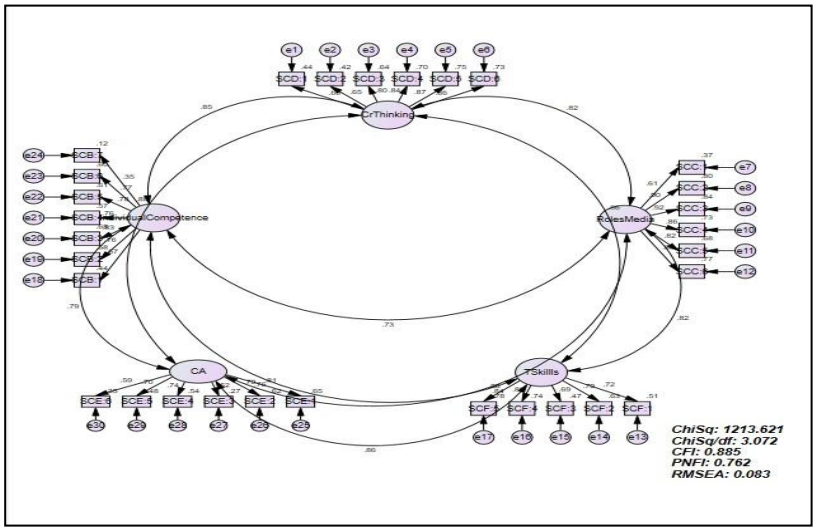

Figure 1: Initial measurement model

The result of fitness indices in Figure 1 indicates that Chisq/df=3.072, CFI=0.885, PNFI=0.762 and RMSEA=0.083. Based on the result obtained, the model is not meet the goodness-of-fit requirement as stated by [17] since the value of CFI<0.9 and RMSEA>0.06. The summary of goodness-of-fit for the initial measurement model was shown in Table 4.

Table 4: Fitness indices for initial measurement model

Fit Indices	Model Value	Accepted Value	Conclusion
Chisq/df	3.072	<5.0	Achieved
PNFI	0.762	>0.05	Achieved
CFI	0.885	>0.90	Not achieved
RMSEA	0.083	<0.06	Not achieved

Since there are problems involved in these fitness indices, the modification indices were constructed to ensure that the model is fit and that model is valid for the representation of the population model. In this stage, a few items were deleted since the factor loading is less than 0.6 as stated by [17]. After conducting an-item deletion process, eleven items were dropped from the model and 20 items with 5 factors remained to achieve a model fit. The measurement model is completed once all the goodness-of-fit indices achieve the required cut-off point. Figure 2 shows the final measurement model for this study.

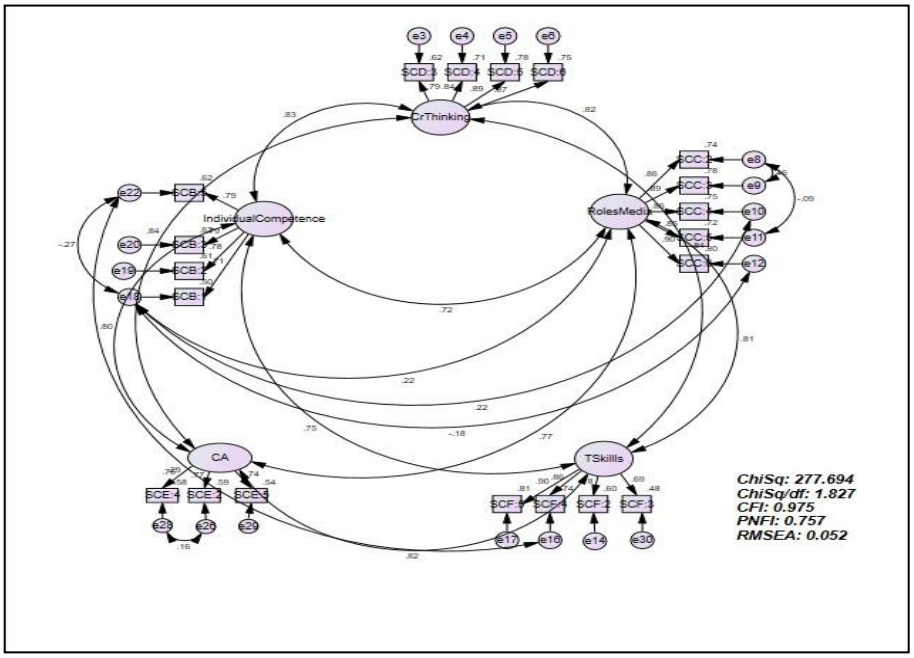

Figure 2: The final measurement model

Figure 2 shows the final measurement model for CFA. Based on the result, it was shown that Chisq/df=277.694, CFI=0.975, PNFI=0.757 and RMSEA=0.052. It can be concluded that the model meets the goodness-of-fit requirement and the model is fit since all the indices value meets the cut-of-point requirement. The summary of goodness-of-fit for the final measurement model was shown in Table 5.

Table 5: Fitness indices for final measurement model

Fit Indices	Model Value	Accepted Value	Conclusion
Chisq/df	1.827	<5.0	Achieved
PNFI	0.757	>0.05	Achieved
CFI	0.975	>0.90	Achieved
RMSEA	0.052	<0.06	Achieved

At this stage, there is no more deleted item since all the criteria were fulfilled. It indicates that the measure items provide sufficient factor loadings (>0.6) for the correlation between students' competencies in digital media literacy, roles of media education, critical thinking skills, communication skills and technical skills.

The validity and reliability of the measurement model were constructs. Table 6 shows the validity and reliability result which contains the factor loading, Cronbach's alpha, CR and AVE value for the student's competencies, roles of media education, critical thinking skills, communication skills and technical skills. The Cronbach's alpha value for all constructs are more than 0.7 which means that all of the variables can be accepted and reliable [17]. Based on the result of the composite reliability (CR) for each variable shows that the values of composite reliability are more than 0.6. While the Average Variance Extracted (AVE) shows that the value for each variable is exceed 0.5. Thus, all the variables fit.

Table 6: Validity and reliability of data

Construct	Item	Factor Loading	Cronbach's Alpha	CR (>0.6)	AVE (>0.5)
Students' Competencies in Digital Media Literacy	B1	0.710	0.839	0.851	0.589
	B2	0.783			
	B3	0.788			
	B5	0.786			
Roles of Media Education	C2	0.859	0.941	0.940	0.757
	C3	0.885			
	C4	0.863			
	C5	0.847			
	C6	0.896			
Critical Thinking Skills	D3	0.789	0.908	0.884	0.658
	D4	0.841			
	D5	0.886			
	D6	0.869			
Communication Skills	E2	0.766	0.814	0.910	0.717
	E4	0.763			
	E5	0.737			
Technical Skills	F2	0.776	0.874	0.800	0.571
	F3	0.690			
	F4	0.863			
	F5	0.900			

Table 7 displays the result for discriminant validity measured by HTMT. The analysis shows that students' competencies in digital media literacy, roles of media education, technical skills, critical thinking skills and communication skills fulfilled the required assumption of this analysis since the correlation value is lower than 0.85 as stated by [19]. The coefficient of determination value, R^2 for this study is 0.627 which indicates that all latent exogeneous variables contributed 62.7% of the total variation in students' competencies in digital media literacy.

Table 7: HTMT analysis

	Students' Competencies in Digital Media Literacy	Roles of Media Education	Technical Skills	Critical Thinking Skills	Communication Skills
Students' Competencies in Digital Media Literacy					
Roles of Media Education	0.778				
Technical Skills	0.785	0.830			
Critical Thinking Skills	0.843	0.822	0.843		
Communication Skills	0.796	0.756	0.817	0.831	

3.4 Structural Model

The structural model in Figure 3 was constructed to test the hypothesis of the significant relationship between students' competencies in digital media literacy and roles of media education, critical thinking skills, communication skills and technical skills.

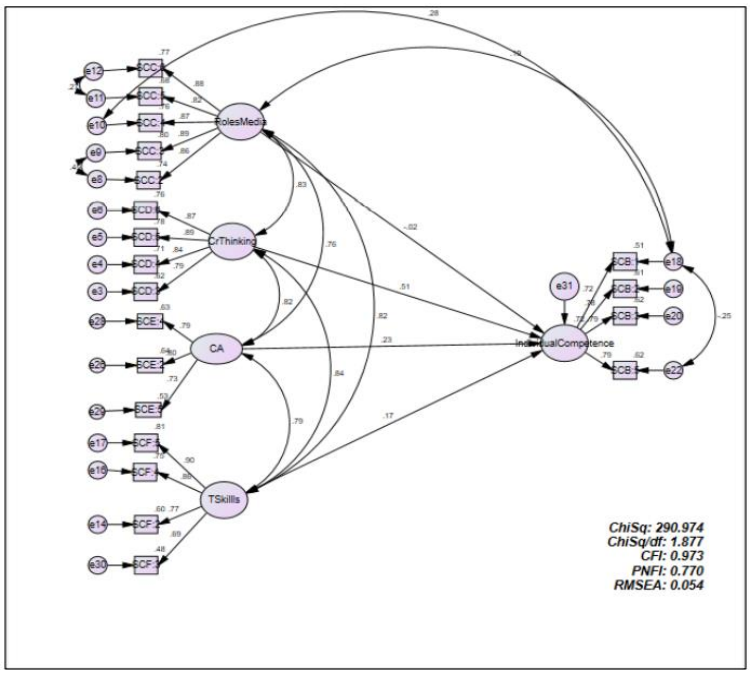

Figure 3: The Structural Equation Model

Figure 3 shows the structural equation model that has achieved the required level of all the fitness indexes, unidimensionality, validity and reliability. The values of Chisq/df=1.877, CFI=0.973, PNFI=0.770 and RMSEA=0.054 shows that the model is fit since all the indices achieve the acceptance level.

Table 8 shows the path analysis of roles of media education, critical thinking skills, communication skills and technical skills towards students' competencies in digital media literacy.

Table 8: The path analysis of SEM

Hypothesis	Construct	Path	Construct	P-value	Findings
1	Roles of Media Education	--->	Students' Competencies	0.838	Failed to reject H_0
2	Critical Thinking Skills	--->	Students' Competencies	< 0.001	Reject H_0
3	Communication Skills	--->	Students' Competencies	0.023	Reject H_0
4	Technical Skills	--->	Students' Competencies	0.683	Failed to reject H_0

Based on the p-value obtained, it indicates that there are two significant variables which are critical thinking skills and communication skills since the p-value for both variables (<0.001 and 0.023 respectively) are less than 0.05 while other two independent variables which are the roles of media education and technical skills are not significant (p-value > 0.05). Therefore, it can be concluded that critical thinking skills and communication skills have a significant and direct effect on individual competencies in media literacy. The summary of the result for the main hypothesis in this study was shown in Table 9.

Table 9: Summary result of hypothesis

Hypothesis Statement	Findings
H_1: Roles of media education have a significant and direct effect on students' competencies in digital media literacy	Not supported
H_1: Critical thinking skills have a significant and direct effect on students' competencies in digital media literacy	Supported
H_1: Communication skills have a significant and direct effect on students' competencies in digital media literacy	Supported
H_1: Technical skills have a significant and direct effect on students' competencies in digital media literacy	Not supported

4 CONCLUSION

This study is carried out to study the significant effects of the roles of media education, critical thinking skills, communication skills and technical skills on individual competencies in digital media literacy among students in UiTM Kota Bharu. Based on the findings, it shows that two variables which are critical thinking skills and communication skills are significantly affect the student's competencies in digital media literacy since the p-value for both variables is lower than 0.05. This result is supported by [9,12]. It can be concluded that the students who have a critical understanding are able comprehensively analyze and evaluate the media content. Therefore, the students can distinguish between sites that contain good and bad information. Since there is a significant effect between communication skills and digital media literacy among students, it indicates that the students can effectively communicate through a variety of digital media tools. The students can transmit information using a digital platform and they can share online content with others. Thus, digital media literacy should be formally included in the education curriculum to gain more awareness of digital media literacy among students. From that, the students have the competency in evaluating the positive and negative information from the digital media platform.

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